

The U.S. Fish and Wildlife Service has solicited my peer-review of the proposed rule to list the West Coast Distinct Population Segment of the fisher (fisher, DPS) as a threatened species under the Federal Endangered Species Act.

My expertise is as a vertebrate population and community ecologist, with a focus on mesocarnivores. An important caveat to my peer-review is my relative unfamiliarity with this particular population of fisher – my own research on this taxonomic group of mammals has taken place north in Alaska, northern British Columbia and the upper Great Lakes Region, all which feature different habitat types, populations attributes and management issues. Thus, my comments that follow focus on broad aspects of the proposed rule and draft species report.

Overall, I found this to be a very thorough treatment on the status and threats to Pacific fishers. The proposed rule has been well-researched, well-written, and comprehensively captures the current scientific knowledge. Consequently, it is my opinion that the USFWS service has used the best available science to reach conclusions therein.

My review, then, focuses on those few places that were unclear or seemingly inconsistent. I provide my comments in, what I consider to be, order of importance:

1. Most importantly, the draft species report does a commendable job of outlining concerns related the climate change and how future climate projections are very likely to have strong direct or indirect implications for fisher populations regionally. Thus, I was puzzled to find that the proposed rule did not identify climate change as a threat to fisher. For a habitat specialist along the southern range boundary (indeed, a southern range outthrust in California), and given the number, scope and severity of stressors that climate change presents, it is unclear why climate change has not been identified as a threat, and potentially one of *the* most important threats, to fishers regionally. The effects of climate change should (theoretically), and have (empirically) been shown to have particularly strong implications for species along their southern range boundaries. As noted in the species report, climate change will likely interact with other threats like altered fire regimes, habitat quality and distribution, prey base that will like further impact and isolate regional fisher populations. One particular consequence of climate change that appears to have been overlooked in the species report, is its effect on the prey base for fisher. In recent years, there has been surge of research exploring the historic and contemporary effects of climate change and predicting future assemblages of small mammals (e.g., Myer et al. 2009, Schloss et al. 2012) even within the region of interest (e.g., Moritz et al. 2008, Rubidge et al. 2012), and related to the conservation of mustelids (e.g., Carlson et al. 2014). I believe that this is an important facet of climate change that should have been addressed as another secondary stressor of climate change. The species report does explore Krohn's (1995) hypothesis of snow impacting fisher distribution, which is a valid consideration, although any "benefit" of climate change on winter conditions along this southern range boundary strikes me as nominal relative to the risks.

2. Climate change is certain to impact this population, and it is very probable that it will act synergistically (true sense of the word – i.e., combined effects greater than the sum of independent effects) with other aspects of their biology. The uncertainties associated with climate change as to what degree are not unique to this stressor – indeed, all stressors inherently possess some degree of uncertainty and why climate change impacts have been singled out in the ruling because of this, is not clear. Thus, it is my opinion that climate change should be considered as an important stressor and that management decisions need to account for it. With that in mind, and the fact northward shifts of habitat, prey and fisher are likely, the geographic extent of the proposed “alternative” DPS (i.e., Alternative 1 and 2) do not seem suitable. The northern distribution of this fisher DPS paramount to recovery and are not included in either alternative making both, in my mind, inviable. This is particularly germane given that 1) fisher exhibited regional connectivity throughout the Pacific (British Columbia to California) and climate envelope models that show where future suitable habitat will be (all principally in the north of their range). Thus, protection in the northern portions of their regional distribution seems crucial.
3. The case of rodenticides is interesting, and appears to be a very real threat for fisher populations, especially given that adult females (the most elastic vital rate in this population) appears to be impacted by it. However, it also seems that the confirmed mortality associated with rodenticides was 4/58 radio-tagged individuals in California, which does not strike me as strikingly high. It would have been helpful to have been given the other sources of mortality discovered within that study. For example, how many of those were from vehicular strikes? In a prior section of the species report it was reported that a different radio-tracking study found 4/73 individuals were killed by vehicles over a 5 year period. The draft report describes the very high rate of rodenticides residues discovered in fishers, which again is a real concern. However, detection of these compounds does not prove that it’s an etiologic agent of mortality, and secondary consequences of poisons on immune response, reproductive output, etc. has some uncertainties. In sum, it seems apparent to me that 1) rodenticides are an important source of mortality for fisher; 2) that they very likely have sub-lethal consequences that are deleterious and 3) are consequently a very real stressor that we should be concerned with. However, rodenticides seem to receive an inordinate amount of attention and I’m not convinced that they present more of a threat than vehicular strikes or climate change. Managing the threat of rodenticides is tractable compared to climate change or highway mortalities, but does not seem to be more important in terms of severity and scope.
4. My understanding is that all of the reintroduced fisher to Washington were obtained from British Columbia, but that some of the individuals reintroduced to southern Oregon were obtained from Minnesota (although most also from British Columbia). Kyle et al. (2002) found strong geographic structuring of fisher (although they did not sample either Minnesota or this DPS of fisher); Drew et al. (2003) demonstrated that fisher in Minnesota were genetically quite different from British Columbia and that BC and suggested that British Columbia, Washington, Oregon and California were historically connected, although nuclear DNA has shown that there is important structure within California (Tucker et al. 2012). Has the genetic origin of this repopulating population been determined? Have they lost that genetic signature from the Great Lakes and now are comprised of a “western” stock. I would

have found it helpful for a table outlining these sources and number and dates as a table in the species report and what admixture from the Great Lakes means (if anything) in terms of management and recovery of fisher regionally.

I hope that my comments are useful in moving forward to manage this population of fisher. Many thanks for the invitation to review.

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